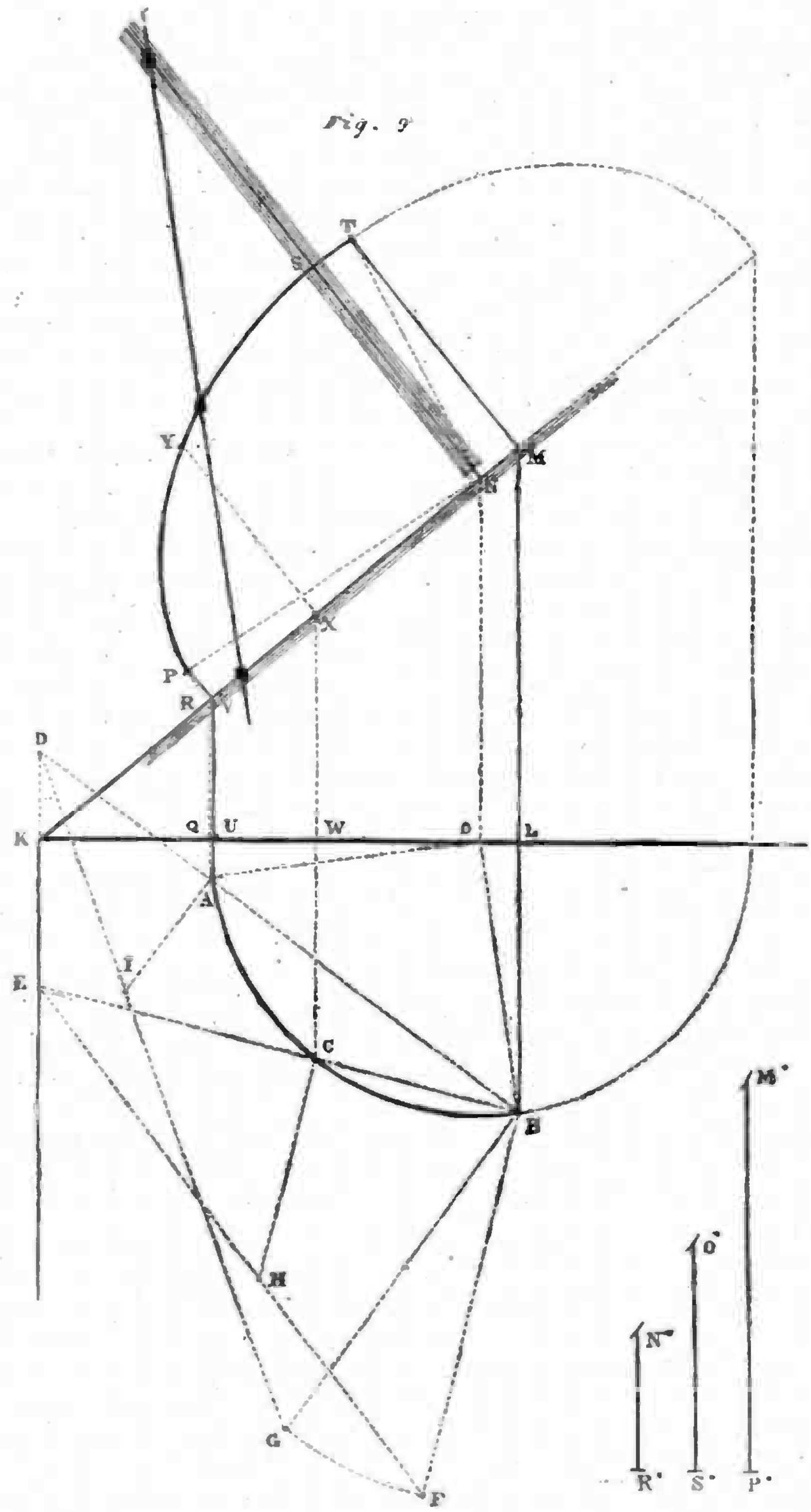

23. Thus in Fig. 9, let the circle A C B represent the centre line of the plan of the rail; let the line N' R' represent the height of the centre of the rail over the point A, the line O' S' the height over the point C, and the line M' P' the height over the point B. Then through the points A B and B C draw the lines B D and B E, upon which draw the perpendicular lines B F, B G, C H, and A I make B F and B G each equal to M' P'; C H equal to O' S', and A I equal to N' R'. Through the points G and I draw the line G D, cutting the line B A produced in the point D; and through the points F and H draw the line F E, cutting the line B C produced in the point E; then through the points D and E draw D E, which is the line or arris of intersection between the plane of the base of the trihedral and the plane of its slanting side; the foot of this slanting surface will therefore rest on the line D E, and the inclination thereof will be such that its plane will pass through the three points on the surface of a cylinder, as we have already noted. And, moreover, as a portion of the base of the cylinder is included in the base of the trihedral, so also will a corresponding portion of the cylindric section be included on the plane of the slanting surface of the trihedral, which we have already described as the cutting plane of the cylindric section.

24. In paragraph 9, and Fig. 2, we have shewn the mode of producing the section of a cylinder by the use of the beam compass; but before this can be done, it is necessary to have the position of a vertical plane passing through the axial line of the cylinder, which also is to be at right angles to the cutting plane of the cylinder. The position, therefore, in which our vertical plane must stand, is that shewn by the line K L, which is to be drawn at right angles through O to the line D E. By changing the position of the vertical plane on the line D B of the trihedral to the line K L, as here shewn, while that of its inclined surface remains in the same position, we shall find that the dihedral or solid angle formed by the intersection of the vertical and slanting planes are at right angles, or square to each other; and if from the point B, on the base of the trihedral, we draw the line B L at right angles to the line K L, we shall find the height of the slanting surface over the point L, to be the same as that over the point B. The elevation of our vertical plane on the line K L, will, therefore, be a right angled triangle, whose hypothenuse, M K, is the intersecting line, or arris, which the vertical surface forms with the slanting surface of the trihedral: and the perpendicular, L M, is equal to B F. Upon this vertical surface let the perpendicular line, O N, represent the axial line of the cylinder; and the perpendicular line, Q R, the line of intersection formed by the surface of the cylinder, with the vertical plane of the trihedral: here, then, because the vertical plane of our trihedral passes through the axial line of the cylinder; therefore that portion of the intersecting line, R N, will form one-half of the longitudinal diameter of the ellipse; and the radius of the cylinder will be equal to one-half the transverse diameter, as shewn by the line N S, from which the curve of the ellipse may be described, as shewn in paragraph 9, Fig. 2; but that portion of the elliptic curve, requisite for the centre line of our face mould, may be obtained by drawing the ordinates, M T and V P, at right angles to the line K M, cutting the curve in the points P and T. The point Y in the curve, which stands perpendicularly over the point C on the plan, may also be determined in the curve by drawing the corresponding ordinates, W C and X Y, in the same manner as the ordinate M T.

ON THE APPLICATION OF CLAY PIPES FOR HOUSE DRAINS AND SEWERS.

BY W. D. GUTHRIE, A.M., F.R.C.S.L., &c.

After much consideration of the best system of the construction of main sewers, I have at last arrived at such conclusions as neither I nor any of those scientific friends whom I have consulted on the subject, are able to detect any mistakes in. The first leading principle which I am desirous shall be distinctly understood is this, viz.: That there is no other proper means of removing the débris of houses, towns, and cities, whether large or small, but through the agency of water, which cannot be too abundantly supplied.

How properly to direct and duly to economise water furnished for this purpose must hence be a matter of paramount importance. That none shall be wasted carelessly, and that as small a quantity may on all occasions be rendered as efficient as possible, are matters of the greatest moment. These therefore are my cardinal points.

It now became to me manifest that from these premises the grand object would be, so to proportion drains that the supply of water would at all times be effectual in removing soil and preventing depositions of all kinds.

This, it is clear, could only be done by causing them to bear a proper ratio to the roofage, and the size of tubes through which water is conveyed to the house from which the drain is to be led. Now if, as is almost always the case, the water-pipe of an establishment leading from the main, be only half an inch, or say an inch, it struck me that there could be no necessity for a construction of one foot, one and a half, two, and even three feet calibre to conduct this water and its accompaniments from the house into the common channel or main street sewer, it having merely acquired the addition of the soil. For example, if I furnish a house with water by means of a half-inch water-pipe, it is clear, the most that a drain could ever be called upon to accomplish, would be to afford a conduit to the main sewer, but if water can flow through a half-inch tube, it assuredly can meet with no obstacle or hindrance to its progress in a two or three inch tube, care being taken that sufficient strength be given to the drain tube.

The rule for the size of the drain-tube is therefore simple, viz. to the calibre necessary to carry off the water laid on, add that required for the reception of the rain or surface water. This is readily calculated from the indications of the rain gauges of the locality. I conceive that the grand point in the arrangements is never to have the capacity of the sewer so vast, that the advantages of the force of the water, which it is intended it should transmit, shall be lost, which of course must necessarily be the case, if such disproportions occur as that which I have already mentioned. The next point I had to establish was the nature of the materials best calculated